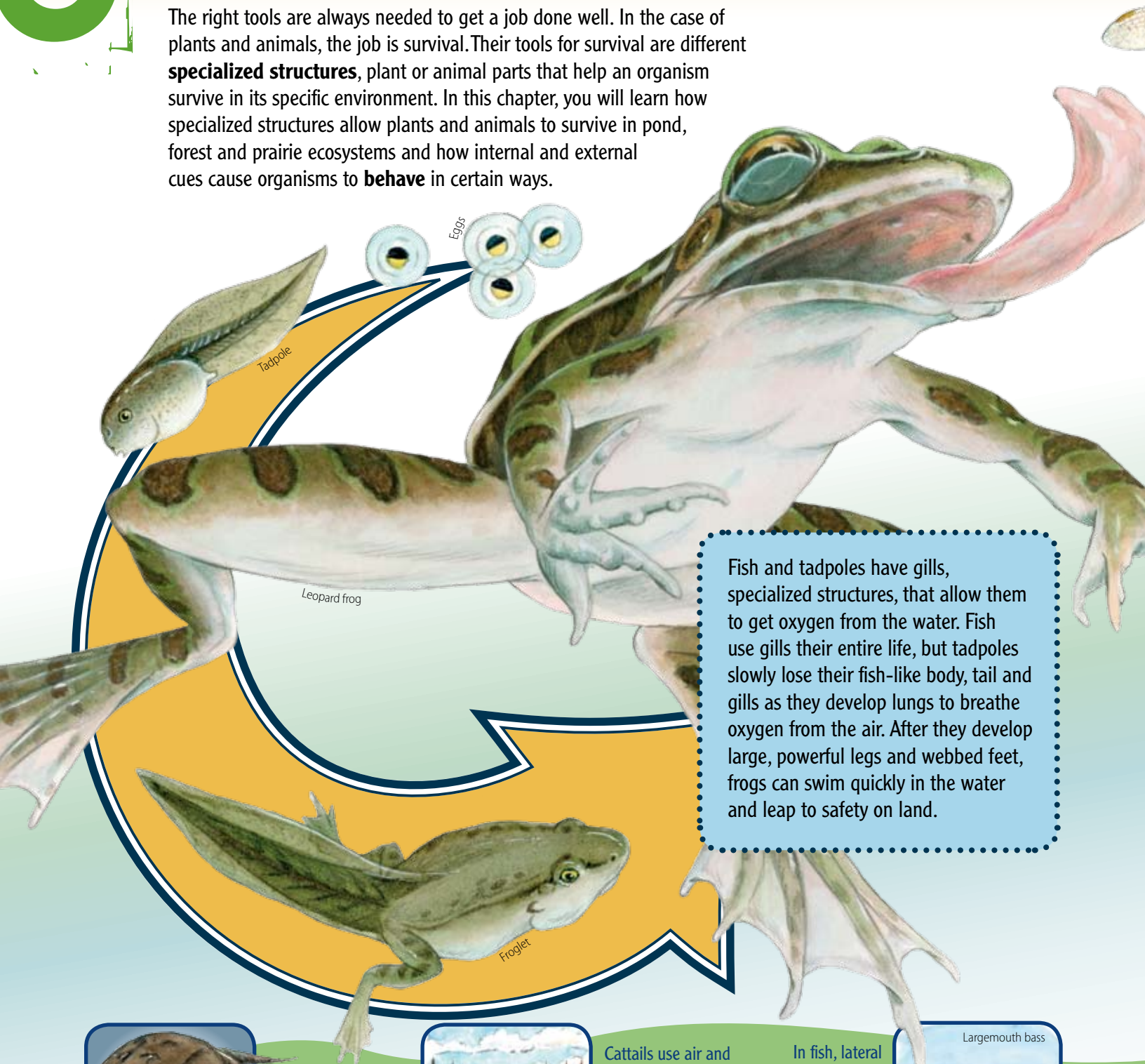
3 having what it takes—to survive!

The right tools are always needed to get a job done well. In the case of plants and animals, the job is survival. Their tools for survival are different **specialized structures**, plant or animal parts that help an organism survive in its specific environment. In this chapter, you will learn how specialized structures allow plants and animals to survive in pond, forest and prairie ecosystems and how internal and external cues cause organisms to **behave** in certain ways.

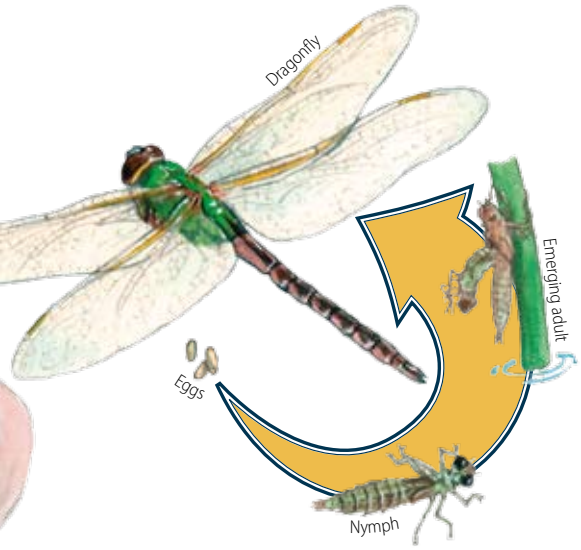


Fish and tadpoles have gills, specialized structures, that allow them to get oxygen from the water. Fish use gills their entire life, but tadpoles slowly lose their fish-like body, tail and gills as they develop lungs to breathe oxygen from the air. After they develop large, powerful legs and webbed feet, frogs can swim quickly in the water and leap to safety on land.

A common snapping turtle has great big jaws, that help it snap up organisms as large as fish and snakes.

Cattails use air and mud to reproduce. When their fluffy seeds are blown away and land in mud, new plants can grow.

In fish, lateral lines along their sides are sense organs that detect movement and vibration in the water.



Dragonflies begin their lives in the water as nymphs with gill-like structures on their abdomen. When a dragonfly nymph is ready to change into an airborne adult, it climbs out of the water on the stem of a water plant, sheds its outer skin and uses its new special mouth parts and wings to eat while hovering and flying.

survival tools in a pond ecosystem

Plants and animals that spend all or part of their life in water must have specialized structures to survive in a watery environment.

Long toes allow great blue herons to move easily through ponds without sinking into the soft mud. Their long, slender necks and long, sharp beaks help them snatch fish and frogs from under water.

Pond plants have special structures that help them survive in their underwater surroundings or environment. Waxy or slimy coatings protect them from drying out when water levels drop. Special openings on stems or leaves let them absorb minerals directly from the water. Roots hold arrowhead and cattails in place while the above-water leaves of these plants bring air down to the roots. Tiny duckweed plants with thread-like roots survive by floating on the surface of the water.

Great blue heron

Bluegill

Frogs use their large, bulging eyes to eat! Frogs usually take in their food whole and use their eyeballs to squash down and swallow their meal.

Camouflage is one of the best survival tools an animal can have. Whether an animal is hunting or hiding, survival often depends on blending in and not being seen. Bluegill have light, vertical stripes that help them blend in when they hide among pond plants. Dark coloration on the top of channel catfish camouflages them and helps them blend into the mud at the bottom of the pond.

survival tools in a forest ecosystem

Trees have specialized structures to help them survive on land. Roots spread out almost twice as far as a tree is tall. Roots grow as they search for air, water and minerals in the soil. Tap roots grow deep down through the soil seeking water. Trunks support the branches and carry water and nutrients to and from the leaves. Bark wraps around and protects trees from injury and insects. Branches and leaves make up the tree's crown. Leaves use energy from the sun to produce food for the tree.

Seeds from trees and other forest plants also have specialized structures. Wing-like parts, fluffy coverings, and sticky surfaces are specialized seed structures. These specialized structures help seeds travel to places where they can find a place to grow.

Wing-like structures allow seeds to whirl and spin through the air. The spinning movement helps to plant the seed into the ground.

Seeds with soft fluffy coverings float through the air.

Seeds with prickly, sticky surfaces can hitch rides on the fur of animals and even on a person's clothing.

Forest animals have their own set of survival tools. Their specialized structures help them to see, hear and smell the plants and animals around them, to move silently, and to blend into their surroundings. Bobcats, for example, use their soft foot pads, dappled-colored fur and keen vision and smell to sneak up on rabbits. Rabbits, mice, voles and squirrels also have keen hearing, which they use to detect and escape from bobcats, owls and other animals that hunt them.

Special, sharp teeth help squirrels and deer crunch through tough acorns. Birds crack tough seed shells with sharp, specially shaped beaks. A 4-chambered stomach allows deer to digest grasses.

Glands are another type of specialized structure. Some snakes have glands that produce venom used for protection and to make their food hold still. Io moth caterpillars are bright green and have a red and white stripe along the sides of their bodies and many spines that are painful to touch. Whiskers on mammals and antennae on insects are also examples of specialized structures used by organisms to gather information about their environment.

Great horned owl

An owl's huge eyes gather enough light to give them excellent night vision. What may look like ears on some owls are actually tufts of feathers. Ear openings are hidden under feathers and located to the sides of and just behind the eyes.

Sharp talons allow owls to grasp unsuspecting mice.

Softly ruffled and dark-colored feathers allow owls to swoop down silently on their prey in the dark of night.

Animals are torn apart with an owl's talons and sharp beak or swallowed whole. Bones, feathers and fur that are too hard to digest are coughed up hours later in a firm, rounded pellet. Owl pellets reveal clues and solve mysteries about what an owl has captured and eaten.

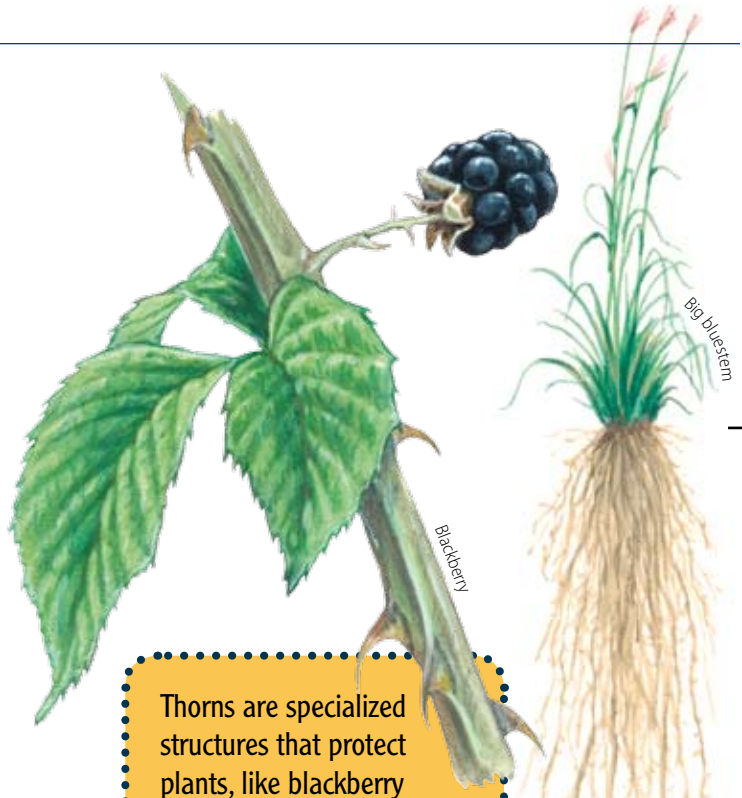
Flying squirrels are gliders rather than fliers. To move from tree to tree, a flying squirrel leaps and stretches its loose folds of skin out to the sides. This skin acts like a flat parachute.

survival tools in a prairie ecosystem

Prairie plants have specialized structures that help them survive in their environment. Special root systems allow them to grow deep down into the soil to reach water and nutrients and to anchor plants against strong winds and to protect them during dry weather. Big bluestem and little bluestem are common prairie grasses that grow in bunches with roots as deep as 8 feet. Prairie blazing star and compass plants have roots that can reach down as far as 15 feet. Stems of prairie roses and blackberries have sharp thorns to discourage animals from eating them.

Specialized eyes, ears, feet, teeth, beaks and whiskers are survival tools for prairie animals. Badgers use large claws for digging burrows and defending themselves. Coyotes depend on their keen sense of smell, hearing and sight to catch mice running through the tall grass. Prairie voles and plains pocket gophers have strong front paws for tunneling underground to safety and to find roots and leaves to eat.

In vast open prairies, camouflage is a very important survival tool. Most prairie animals have colors and patterns on their bodies that help them blend into the prairie grasses and flowers.



Thorns are specialized structures that protect plants, like blackberry bushes, from hungry animals. Thorns are actually branches or stems that are shaped with hard, sharp, pointed ends.

Big bluestem can grow roots as deep as 8 feet.

A bullsnake's color and markings keep it camouflaged so it can sneak up on its food *and* stay hidden from animals that want to eat it.

Being bright pink might not seem like a good camouflage color unless you live among the brightly colored flowers of a prairie.

Hummingbirds are the only birds that can fly backwards, and they can hover in mid-air by rapidly beating their wings 53 times per second!

oh, behave!

Survival of organisms in all three of these ecosystems also depends on how the organisms behave when they get cues or signs, either from their own bodies or from the world around them. Organisms respond to internal cues and external cues by changing their **behavior** in a way that will allow them to survive.

Internal cues are the ones an organism receives from inside itself. Hunger is an internal cue, and it will cause an animal to stop whatever it is doing and start hunting or foraging for food. Internal cues cause thirsty animals to search new places for water. High heat and dryness caused by lack of rain are **external cues**. Trees and other plants respond to these external cues by sending roots deeper into the ground to seek water. Deep, specialized roots of prairie grasses hug the soil and hold water like a sponge. This helps the grasses and forbs survive even when there is little or no rain.

Movement and sound are external cues that cause animals to take notice. For most animals, sudden movement or sound signals possible danger and prompts them to run, fly, swim or stay perfectly still.

Weather, temperature and amounts of daylight and darkness are some external cues that cause organisms to change behavior. Missouri's pond, forest and prairie organisms automatically change behavior in the fall when days are shorter and cooler. Snakes, lizards and certain frogs seek out dens or abandoned burrows to **hibernate** or sleep for the winter. Some frogs and snails burrow into the mud at the bottom of the pond to survive the cold winter.

Tree squirrels, mice and beavers stay active through the winter. However, cooler temperatures and shorter days are external cues that drive them to eat more food to insulate their bodies with extra layers of fat. Fall's external cues also prompt them to gather and store larger amounts of food to last through the winter.

Spiders and insects whose life cycles end with winter spend the cool fall months finding mates and eating extra amounts of food for energy to lay eggs that will hatch out in the spring. Other pond, forest and prairie insects sense these external cues and prepare for winter by hiding underground, in soft, muddy pond bottoms, in small openings in tree bark, or in tunnels burrowed deep within rotting logs or tree branches.

Some birds find enough seeds and dried berries to survive Missouri winters. Others such as ducks, geese and hummingbirds react to those external temperature and daylight cues by migrating hundreds of miles south to spend winter in warmer climates. Ducks and geese migrate in various V-shaped patterns and often noisy flocks. Hummingbirds migrate alone.

Plants in ponds, forests and prairies also react to fall's external cues. Certain trees and plants prepare for winter by cutting off nutrients to leaves and stems. The leaves become dry and fall, and the trees and plants reserve energy by going dormant, slowing down growth.

As winter melts away and days become longer and warmer, external cues of spring trigger the return of migratory birds and the awakening of hibernating and dormant organisms. Frogs and salamanders seek mates and lay eggs in the cold, late winter ponds. Snakes and turtles emerge. Insects hatch. Voles and mice, who scurried under blankets of snow, must now move cautiously on the ground. Hawks and foxes, who struggled during the winter to find snow-hidden mice and voles, now become more successful and are able to feed their young.

Small understory trees and plants such as dogwoods and mayapples sense external temperature and daylight cues. They bloom early in the spring before the leaves of taller trees unfurl in the canopy and block the sun from the forest floor.

summary

Specialized structures and camouflage help organisms stay safe and survive in their ecosystems. Survival means these plants and animals will be able to grow, reproduce and increase their populations.

Organisms also react to internal and external cues. These cues cause animals to behave in ways that will also help them survive.

A thirteen-lined ground squirrel's heartbeat changes from 350 beats per minute to only five beats per minute during hibernation.

Plains pocket gophers run backwards in their burrows as fast as they run forward. Their loose skin lets them turn a somersault in the tunnel for a quick getaway.

A mayapple's umbrella-like leaves grow each spring for seven years before it has a flower.

Can you tap your feet 350 times in one minute?